

Semiquantitative Analysis of Feedback Systems for Resistive Wall Modes

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Abstract

Resistive wall modes (RWMs) are long wavelength plasma instabilities that would be stabilized if the surrounding walls were perfectly conducting. In DIII-D, RWMs limit lifetime and β achieved in advanced tokamak regimes, thus the feasibility of RWM stabilization through application of external magnetic fields from a feedback system is being investigated. To understand the behavior of different feedback algorithms and as a guide in the optimization of parameter settings, a “simple” feedback model is desirable. Here, we describe a formulation of the Intelligent Shell problem which includes a realistic modeling of the electronics system involved. Analysis using this formulation is reduced to finding roots of a polynomial. Experimental parameter scans with present DIII-D RWM feedback system show quantitative agreement with the model.

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